Section 4
Maintenance

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRICAL SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

4-1. INTRODUCTION

4-2. This section of the manual contains maintenance information for the 8050A. This includes access procedures, disassembly and replacement procedures, performance tests, calibration adjustments, and troubleshooting procedures. The performance tests are recommended as an acceptance test when the instrument is first received. The performance tests can also be used as part of a routine preventive maintenance schedule.

4-3. A one-year calibration cycle is recommended to maintain specifications given in Section 1 of this manual. The test equipment required for the performance tests or calibration adjustments is listed in Table 4-1. Test equipment with equivalent specifications may be substituted for the recommended model.

4-4. SERVICE INFORMATION

4-5. The 8050A is warranted for a period of one year upon shipment to the original purchaser. Conditions of the warranty are given at the front of this manual. Malfunctions that occur within the limitation of the warranty will be corrected at no cost to the purchaser. For in-warranty repair, call (toll-free) 800-426-0361 for the address of the nearest Fluke Technical Service Center. In Alaska, Hawaii, Washington, or Canada call 206-356-5400 (toll-call). Ship the instrument postpaid in the original container. If the original container is not available, pack the instrument in a sturdy carton with at least three inches of non-settling padding on all sides. Dated proof-of-purchase may be required for in-warranty repairs.

4-6. Fluke Technical Service Centers are also available for calibration and/or repair of instruments that are beyond the warranty period. Call the number listed above for shipping instructions. Ship the instrument and remittance in accordance with the instructions received.

4-7. GENERAL INFORMATION

4-9. Interior Access

4-10. The instrument has two pcb assemblies: the Main PCB Assembly and the Display PCB assembly. To gain access to the calibration adjustments, the backup fuse, or the ac line transformer, only the case needs to be removed. Some troubleshooting can also be accomplished with only the case removed. Other troubleshooting procedures may require the removal of the Display PCB assembly.

CAUTION

To avoid contaminating the pcb assemblies with oil from the fingers, handle the assemblies by the edges or wear gloves. If an assembly does become contaminated, refer to the information on cleaning pcb's given later in this section.

Table 4-1. Required Test Equipment

INSTRUMENT TYPE	REQUIRED CHARACTERISTICS	RECOMMENDED MODEL
DMM Calibrator	DC Voltage 0 to 1000V ±.006% AC Voltage 100 Hz 0 to 750V ±.06% 200 Hz 0 to 2V ±.06% 1 kHz 0 to 750V ±.06% 10 kHz 0 to 100V ±.06% 20 kHz 0 to 100V ±.1% 50 kHz 0 to 20V ±.5% DC Current 0 to 2000 mA ±.035% AC Current 19 mA, 100 Hz ±.1% Resistance 100Ω, 1 kΩ ±.01% 10 kΩ, 100 kΩ ±.005% 1 MΩ, 10 MΩ ±.05%	John Fluke Model 5100B
Digital Multi-Meter (DMM)	.1 mV resolution	John Fluke Model 8020B
Calibration Leads	24" Shielded cable with a double banana plug at both ends	Pomona 2BC-24

4-11. CALIBRATION ACCESS

4-12. Use the following procedure to gain access to the calibration adjustments or the backup fuse (F2):

1. Set the POWER switch to OFF.
2. Remove the power cord from the rear of the instrument.
3. Remove the screw located directly below the power receptacle.
4. Grasp the front panel and slide the instrument out of the case.
5. The backup fuse and calibration adjustments are now accessible on the underside of the instrument (as viewed from the front panel).

NOTE

With the power cord replaced, the instrument is operational for troubleshooting.

WARNING

DANGEROUS VOLTAGES EXIST ON THE PCB ASSEMBLIES WHEN ENERGIZED. EXERCISE EXTREME CARE WHEN WORKING ON AN ENERGIZED CIRCUIT.

6. To reassemble, reverse the previous procedures in a logical order.

4-13. DISPLAY PCB ACCESS

4-14. Use the following procedure to access the Display PCB for troubleshooting:

1. Complete the Calibration Access procedure.
2. Refer to Figure 4-1. Turn the instrument over and remove the indicated screws.
3. The LCD, POWER switch, and RELATIVE switch are mounted on the Display PCB Assembly. Gently push on the LCD and POWER switch, sliding the assembly towards the rear of the instrument until the LCD and the switches clear the front panel and the right-hand side pcb edge slot.
4. Flip the Display PCB over on the right side of the instrument.

CAUTION

The Display PCB is connected to the main pcb by a flexible ribbon cable (interconnect). This cable remains attached for service operation. Avoid straining the interconnect cable while working on the instrument.

5. To reassemble, reverse the preceding procedures in logical order.

4-15. DISPLAY PCB REMOVAL

4-16. Use the following procedure to remove the Display PCB from the instrument:

1. Complete the Display PCB Access procedure.
2. Remove the screws (two) from the plastic bar that clamps the Interconnect cable to the Display PCB.
3. Remove the plastic bar and gently lift the Interconnect cable from the sides. To avoid contamination, do not to touch the metal contact strips on the underside of the Interconnect cable.
4. To reassemble, reverse the preceding procedures in logical order.

4-17. LCD REMOVAL

4-18. Use the following procedure to remove the LCD (Liquid Crystal Display) from the Display PCB Assembly:

1. Complete the Display PCB Access procedure.
2. Remove the two screws located on the foil side of the Display PCB Assembly.

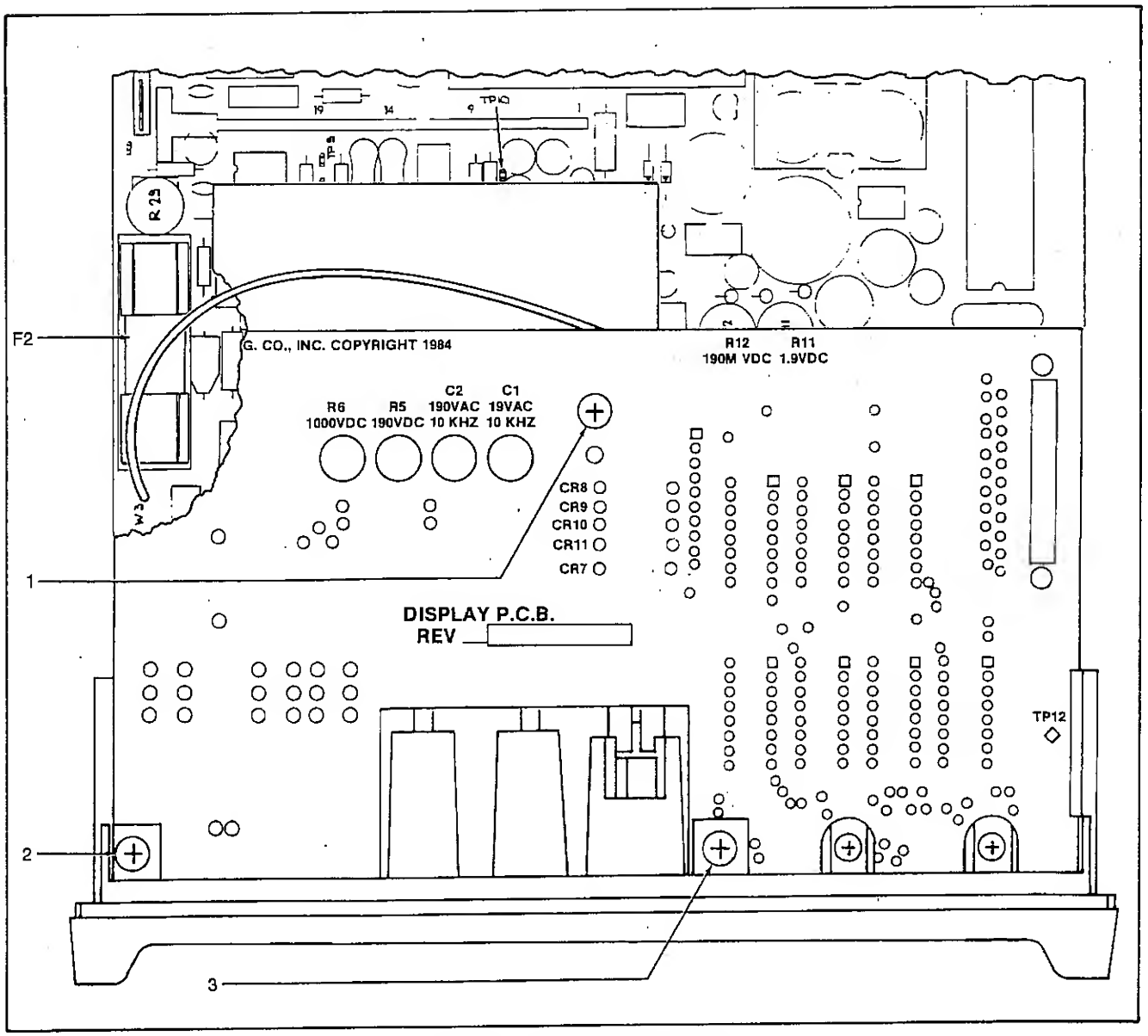


Figure 4-1. Display PCB Access

3. Using your fingernail, pry the grey tabs on the LCD bezel free from the screw posts and remove.

4. To reassemble, reverse the above procedures in a logical order.

4-19. BACKUP FUSE REPLACEMENT

4-20. Use the following procedure to replace the backup fuse (F2):

1. Complete the Calibration Access procedure.

2. Using a wide flat-blade screwdriver, pry the fuse out from the fuse holder. (Refer to Figure 4-1 for the location of F2.)

3. Replace the defective fuse a 3A, 600V fuse (mfg. part no. BBS-3).

4-21. AC LINE VOLTAGE SELECTION

4-22. The 8050A is configured at the factory for a specific ac line voltage. The configured ac line voltage is listed on a decal located on the bottom of the unit. Line voltage changes require the ordering of a new transformer for the instrument. Refer to the Main PCB Assembly parts list in Section 5 for the part number of the required transformer.

NOTE

Instruments with Option 8050A-01 Rechargeable Battery use a different procedure for changing the ac line voltage. Refer to Section 6 for this procedure.

4-23. Use the following procedure to change the ac line voltage configuration on the 8050A:

1. Complete the Calibration Access procedure.

2. Remove the transformer and replace it one for the intended line voltage.

3. Relocate the white wire (from the power receptacle) to the pcb hole labeled with the correct voltage.

4. Remove the case and relabel the ac line voltage designation on the decal at the bottom of the instrument.

4-24. dB Reference Impedance Power-Up Setting

4-25. The following procedure sets the default (at power up) dB reference impedance to any one of the 16 available impedances. In the standard configuration (no diodes installed), the default reference impedance is 600Ω.

1. Complete the Display PCB Access procedure.

2. Locate the diode mounting positions on the Display PCB Assembly (just to the right of the calibration access holes, viewed from the front of the instrument).

3. Refer to Table 4-2 and install diodes as shown for the desired reference impedance.

4. Reassemble the instrument.

Table 4-2. dB Impedance Selection

REFERENCE IMPEDANCE	CR8	CR9	CR10	CR11
50	–	◁	◁	–
75	–	◁	–	◁
93	◁	–	–	–
110	◁	–	◁	◁
125	◁	–	◁	–
135	◁	◁	–	◁
150	◁	◁	–	–
250	◁	◁	◁	◁
300	◁	◁	◁	–
500	◁	–	–	◁
600	–	–	–	–
800	–	–	◁	◁
900	–	–	◁	–
1000	–	◁	–	◁
1200	–	◁	–	–
8000	–	–	–	◁

Diode Type: Use Fluke P/N 203323 (1N4448, 1N914 or equivalent)

4-26. Cleaning

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. These solutions will react with the plastic materials used in the instrument.

CAUTION

Do not allow the LCD to come in contact with moisture. Remove the LCD from the Display PCB Assembly before cleaning the pcb, and do not install the LCD until the pcb is completely dry.

4-27. Clean the front panel and case with a mild solution of detergent and water. Apply the solution with a soft cloth. Do not apply the solution directly to the front panel. Clean dust and debris from the pcb's with low-pressure (20 psi) dry air. Clean contaminates from the pcb's with isopropyl alcohol and a soft brush. Rinse with demineralized water while scrubbing with a soft brush. To dry the pcb's, remove any ICs in sockets and use low-pressure dry air, then bake at 50 to 60°C (124 to 140°F) for 24 hours. Replace any components removed for cleaning and reassemble the instrument.

4-28. PERFORMANCE TESTS

4-29. The performance tests are used to compare the 8050A performance with the list of specifications given in Section 1. We recommended that you run the performance tests for incoming inspection and periodic calibration. If the instrument fails any of the performance tests, then calibration adjustment and/or repair is needed.

4-30. Initial Procedures

4-31. Before begining each of the tests, perform the following:

1. Remove all test leads.
2. Check the fuses and, if necessary, replace.
3. Set the POWER switch to ON, and allow the 8050A to stabilize for approximately 5 minutes. Conduct the tests in an environment with an ambient temperature of 23 ± 5°C (73 ± 9°F) and a relative humidity of less than 80%.

4-32. Display Test

4-33. Use the following procedure to verify the proper operation of the LCD:

1. Select the kΩ function, 200Ω range.
2. Verify that the overrange indicator (1) is displayed.
3. Connect the red test lead to the V/kΩ/S input connector and the black test lead to the COMMON input connector.
4. Refer to Table 4-3. Short the test leads together and verify that the display reads as shown for each of the resistance ranges.

Table 4-3. Display Test

SELECT RANGE	DISPLAY
200Ω	00.00*
2 kΩ	.0000*
20 kΩ	0.000
200 kΩ	00.00
2000 kΩ	000.0
20 MΩ	0.000

*Due to test lead resistance, the least significant digit(s) may fluctuate by several counts.

5. Select the DC V function, press the REF Z switch to the in position (on) and verify that four decimal points appear on the display.
6. Select the 200V dc range.
7. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.
8. Adjust the DMM Calibrator until the 8050A displays + 188.88V dc exactly.
9. Verify that all segments of the 8050A LCD are illuminated and the HV annunciator appears in the display.
10. Set the DMM Calibrator for a –39V dc output.
11. Verify that the HV annunciator disappears and the polarity indicator changes to – (negative).
12. Select the dB function on the 8050A, then set the RELATIVE switch to ON (in).
13. Verify that the dB and REL annunciators are illuminated.
14. This concludes the Display Test. Remove power from the DMM Calibrator before dismantling the test setup.

4-34. Linear Voltage Test

4-35. Use the following procedure to verify the proper operation of the ac and dc voltage measurement functions:

1. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.

2. For each step in Table 4-4, select the switch positions shown and adjust the DMM Calibrator to the required 8050A voltage input level and frequency, then verify that the 8050A display reading is within limits.

3. This concludes the Linear Voltage Test. If desired proceed directly to the dB Voltage Test.

4-36. dB Voltage Test

4-37. Use the following procedure to verify the proper operation of the dB voltage measurement function:

1. Complete the Linear Voltage Test.

2. Select the AC dB function, 200mV range.

3. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.

4. For each step in Table 4-5, adjust the DMM Calibrator to the required 8050A voltage input level and frequency, then verify that the 8050A display reading is within limits.

Table 4-4. Linear Voltage Test

STEP	UUT SWITCH POSITIONS		UUT INPUT		DISPLAY READING
	AC/DC	RANGE	LEVEL	FREQUENCY	
1	DC	200 mV	+190 mV dc		+189.92 to +190.08
2			−190 mV dc		−189.92 to −190.08
3		2V	+1.9V dc		+1.8992 to +1.9008
4			−1.9V dc		−1.8992 to −1.9008
5		20V	+19V dc		+18.992 to +19.008
6		200V	+190V dc		+189.92 to +190.08
7		1000V	+1000V dc		+999.5 to +1000.5
8	AC	2V	Short		<.0040
9		200 mV	190 mV ac rms	100 Hz	188.95 to 191.05
10				10 kHz	188.95 to 191.05
11				50 kHz	180.20 to 199.80
12		2V	100 mV ac rms	100 Hz	985 to 1015
13			1.9V ac rms	100 Hz	1.8895 to 1.9105
14				10 kHz	1.8895 to 1.9105
15				50 kHz	1.8020 to 1.9980
16		20V	19V ac rms	100 Hz	18.895 to 19.105
17				10 kHz	18.895 to 19.105
18				50 kHz	18.020 to 19.980
19		200V	190V ac rms	100 Hz	188.95 to 191.05
20			100V ac rms	10 kHz	99.40 to 100.60
21		750V	750V ac rms	100 Hz	745.2 to 754.8
22				1 kHz	745.2 to 754.8

Table 4-5. dB Voltage Test

STEP	SELECT RANGE	INPUT		DISPLAY READING
		LEVEL	FREQUENCY	
1	200 mV dB	Short Circuit		Below –75 dB
2		10.00 mV ac rms	100 Hz	–37.28 to –38.28
3		10.00 mV ac rms	10 kHz	–37.28 to –38.28
4		1.0000V ac rms	100 Hz	+02.07 to +02.37

5. Disconnect the DMM Calibrator from the 8050A.

6. On the 8050A, set the POWER switch to OFF.

7. Set the REF Z switch to ON (in).

8. On the 8050A, set the POWER switch to ON and verify that the display reads 600 (the default reference impedance) for 3 seconds, then sequences through all stored reference values at a 1-second rate. Stored reference impedances are: 50, 75, 93, 110, 125, 135, 150, 250, 300, 500, 600, 800, 900, 1000, 1200, and 8(000).

NOTE

If the default reference impedance of Step 8 is not 600, refer to the dB Reference Impedance Power Up Setting procedure and check if the default reference impedance has been changed.

9. This concludes the dB Voltage Test, remove power from the DMM Calibrator before dismantling the test setup.

4-38. Current Test

4-39. Use the following procedure to verify the proper operation of the ac and dc current measurement functions:

1. Select the DC mA function.

2. Connect the DMM Calibrator to the 8050A as follows: HI to the mA input connector and LO to the COMMON input connector.

3. For each step in Table 4-6, select the range shown and adjust the DMM Calibrator to the required 8050A current input, then verify that the 8050A display reading is within the limits.

4. Select the AC V function, 20mA range.

5. Adjust the DMM Calibrator for an output 19.000 mA,at a frequency of 100Hz.

6. Verify that the display reads between 18.800 and 19.200.

7. This concludes the Current Test. Remove power from the DMM Calibrator before dismantling the test setup.

Table 4-6. Current Test

STEP	SELECT RANGE	INPUT	DISPLAY READING
1	200 μA	190 μA	189.41 to 190.59
2	2 mA	1.9 mA	1.8941 to 1.9059
3	20 mA	19 mA	18.941 to 19.059
4	200 mA	190 mA	189.41 to 190.59
5	2000 mA	1900 mA	1894.1 to 1905.9

4-40. Resistance and Conductance Tests

4-41. Use the following procedure to verify the proper operation of the resistance and conductance measurement functions:

1. Select the kΩ function, 200Ω.

2. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.

3. For each step in Table 4-7, select the range shown and adjust the DMM Calibrator to the required 8050A resistance input, then verify that the 8050A display reading is within the limits.

4. This concludes the Resistance and Conductance Tests. Remove power from the DMM Calibrator before dismantling the test setup.

Table 4-7. Resistance and Conductance Tests

STEP	SELECT RANGE	INPUT	DISPLAY READING
1	200Ω	Short	00.00 to 00.04
2	200Ω	100Ω	99.88 to 100.14
3	2 kΩ	1 kΩ	.9988 to 1.0012
4	20 kΩ	10 kΩ	9.993 to 10.007
5	200 kΩ	100 kΩ	99.93 to 100.07
6	2000 kΩ	1 MΩ	997.2 to 1002.8
7	20 MΩ	10 MΩ	9.972 to 10.028
8	2 mS	1 kΩ	.9985 to 1.0015
9	200 nS	10 MΩ	99.30 to 100.70

4-42. CALIBRATION ADJUSTMENTS

4-43. Under normal operating conditions the 8050A requires calibration once every year. Calibration adjustments are also required after the instrument has been repaired or if it fails any of the Performance Tests. Test equipment required for the adjustments is listed in Table 4-1. Figure 4-2 shows the location of all adjustments for the following procedures. For verification, do the Performance Tests after completing the Calibration Adjustments. If portions of the Calibration Adjustments cannot be completed, refer to the Jumper Selection procedures given later in this section.

NOTE

On the 8050A, set the POWER switch to ON and allow the instrument to stabilize for approximately 5 minutes. Perform the calibration adjustments at an ambient temperature of 23 ±5° C (79 ±9° F).

WARNING

CALIBRATION ADJUSTMENTS ARE PERFORMED ON ENERGIZED CIRCUITS. EXERCISE CAUTION AT ALL TIMES, AND USE A NON-CONDUCTIVE TOOL FOR ALL ADJUSTMENTS.

4-44. DC Calibration

4-45. Use the following procedure to perform a DC Calibration:

1. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.
2. Select the DC V function on the 8050A.
3. Turn on the DMM Calibrator.
4. For each step in Table 4-8, select the range shown, and adjust the DMM Calibrator for the required 8050A voltage input level, then adjust the indicated component to the display limits.
5. This concludes the DC Calibration Adjustment. Remove power from the DMM Calibrator before dismantling the test setup.

4-46. AC Calibration

4-47. Use the following procedure to perform an AC Calibration:

1. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.
2. Select the AC V function.
3. For each step in Table 4-9, select the range shown, and adjust the DMM Calibrator to the required 8050A voltage input level and frequency, then adjust the indicated component to the display limits.
4. This completes the AC Calibration procedure. Remove power from the DMM Calibrator before dismantling the test setup.

4-48. Jumper Selection

4-49. If the calibration adjustments do not bring the instrument within specifications or if certain critical components (VR1 or U32) have been replaced, complete one of the following jumper selection procedures. Jumper locations are shown in Figure 4-2.

4-50. U5 JUMPER SELECTION

4-51. The U5 jumper selection procedure should be performed if VR1 has been replaced or if R11 does not have a sufficient adjustment range. Use the following procedure to select the proper resistance for U5:

1. Using the 5-pin connector (p/n 537514) provided with the replacement parts kit, short MP20 jumper positions A-B-C-D.
2. On the 8050A, set the POWER switch to ON.
3. Adjust R11 fully counterclockwise.
4. Select DC V function, 2V range.
5. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.
6. Adjust the DMM Calibrator to +1.8888V dc.

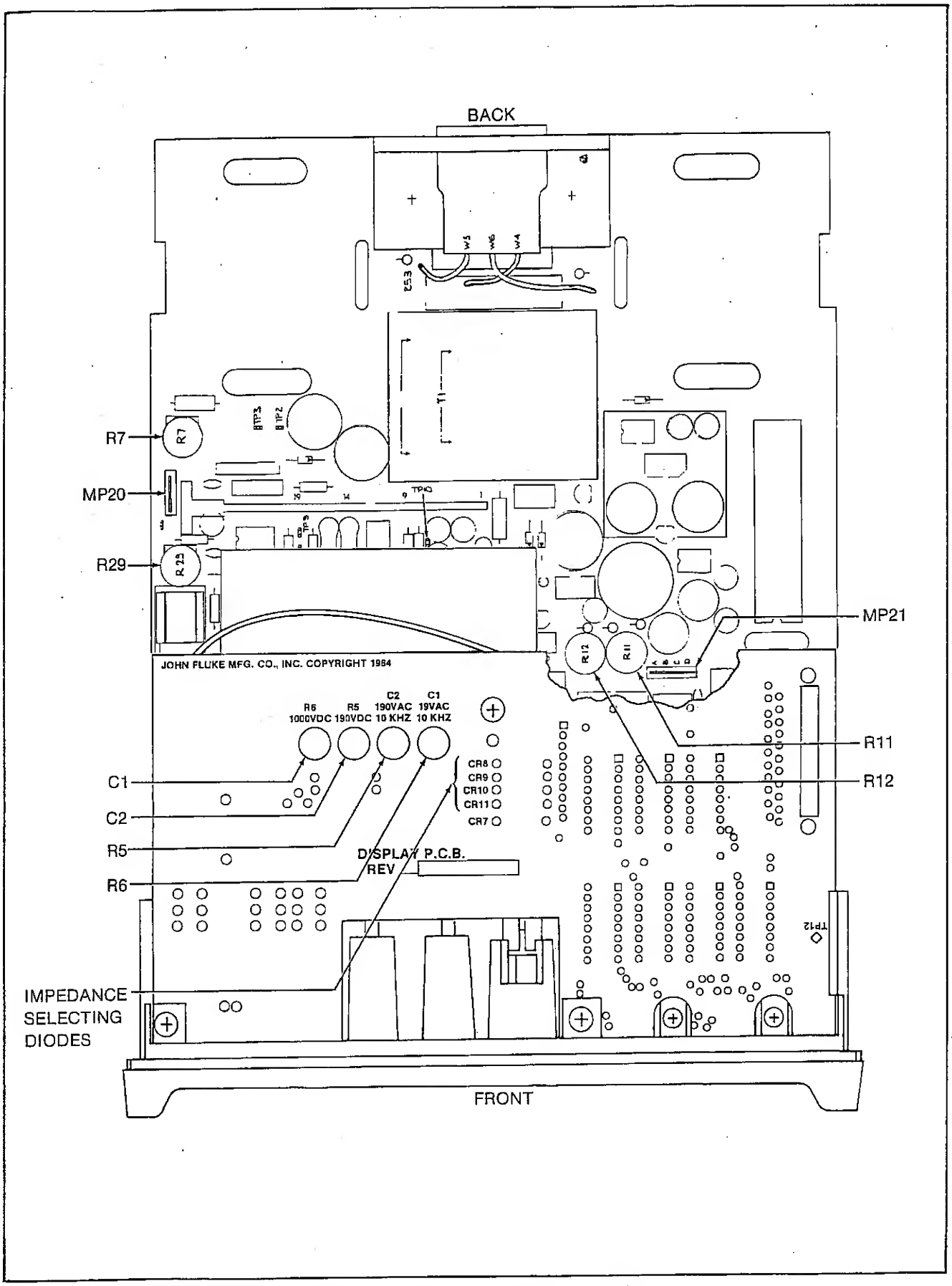


Figure 4-2. Calibration Adjustment Locations

Table 4-8. DC Calibration

STEP	RANGE	VOLTAGE INPUT	ADJUST	DISPLAY LIMITS
1	2V	+1.9000V	R11	+1.9000 exactly [1]
2	200 mV	+190.00 mV	R12	+190.00 exactly
3	200 V	+190.00V	R5	+190.00 exactly
4	1000V dc	+1000.0V	R6	+1000.0 exactly

[1] If R11 can not be adjusted to the DISPLAY LIMIT, refer to the U5 jumper selection procedures in Section 4 of this manual.

Table 4-9. AC Calibration

STEP	RANGE	8050A VOLTAGE INPUT		ADJUST	DISPLAY LIMITS
		LEVEL	FREQ		
1	2V	1.9000V	200 Hz	R7	1.8995 to 1.9005 [1]
2	2V	100.0 mV	200 Hz	R29	.0999 to .1001 [2]
	R7 and R29 are interacting adjustments. Repeat until both are within their limits.				
3	2V	Short circuit			Less than 40 digits [2]
4	20V	19.000V	10 kHz	C1*	18.990 to 19.010
5	200V	100.00V	10 kHz	C2*	99.95 to 100.05
	C1 and C2 are interacting adjustments. Repeat until both are within their limits.				
	*Use an insulated screwdriver for these adjustments.				

[1] If R7 cannot be adjusted to the DISPLAY LIMITS, refer to the U33 jumper selecter procedure in Section 4 of this manual.

[2] If the display is not within limits in step 3 or R29 is outside adjustment range procedure range, refer to the RMS Converter Offset Adjustment procedure in Section 4 of this manual.

7. Turn on the DMM Calibrator.
8. Compare the 8050A display to the LOW and HIGH display readings in Table 4-10 and find the DISPLAY READING that the 8050A display is between. Cut out the portion of the jumper as shown under the JUMPER CONFIGURATION heading that corresponds to the DISPLAY READING.
9. Perform the Calibration Adjustments.

4-52. U33 JUMPER SELECTION

4-53. The U33 jumper selection procedure should be performed if the RMS Converter (U32) has been replaced or if R7 does not have a sufficient adjustment range. Use the following procedure to select the proper resistance for U33:

1. Using the 4-pin connecter (p/n 537522) provided with the replacement parts kit, short MP21 jumper positions E-F-G.
2. On the 8050A, set the POWER switch to ON.
3. Adjust R7 fully clockwise and adjust R29 the center of its range.
4. Select the AC V function, 2V range.
5. Connect the DMM Calibrator to the 8050A as follows: HI to the V/kΩ/S input connector and LO to the COMMON input connector.
6. Adjust the DMM Calibrator for 1.0000V ac rms, at 200Hz.
7. Turn on the DMM Calibrator.
8. Compare the 8050A display to the DISPLAY READING columns in Table 4-11 and find which LOW and HIGH values that the 8050A display reading is between. Cut out the portion of the jumper as shown under the JUMPER CONFIGURATION heading that corresponds to the DISPLAY READING.

measured voltage is beyond the limit, then replacement of the RMS Converter is indicated.

7. Measure the voltage at pin 6 of the RMS Converter. If this voltage is greater than ± 0.5 mV of the recorded value in step 5, adjust the potentiometer on the RMS Converter so that pin 6 is ± 0.2 mV of pin 7.

7. Perform the Calibration Adjustments.

4-57. TROUBLESHOOTING

CAUTION

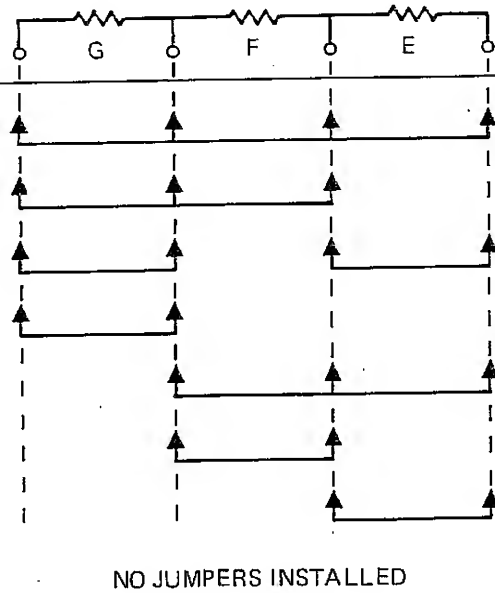
The pcb assemblies used in the 8050A contain CMOS components which are static sensitive. Please read and comply with the information on the static awareness sheet given in the beginning of this section.

WARNING

DANGEROUS VOLTAGES EXIST ON PCB ASSEMBLIES EXPOSED FOR TROUBLESHOOTING. EXERCISE CAUTION WHEN MAKING MEASUREMENTS ON LIVE CIRCUITS, AND USE AN INSULATED TOOL FOR ALL ADJUSTMENTS. SET POWER TO OFF BEFORE REPLACING ANY COMPONENT OR DEVICE.

4-58. The following information is provided to help isolate faults and direct the technician to possible causes. Signal level or node description by test point is given in Table 4-12. A troubleshooting guide is presented in Table 4-13. This guide is intended to be used in conjunction with the Performance Tests. After completing the tests, note any discrepancies that have occurred, find the test heading in Table 4-13 and the apparent symptom, and use the possible cause as a starting point in troubleshooting the problem.

Table 4-11. U33 Jumper Positions

DISPLAY READING (All Jumper Pins Installed)		JUMPER CONFIGURATION, MP20 AS VIEWED FROM LEFT SIDE OF 8050A
LOW	HIGH	
1.0100	1.0497	
1.0498	1.0932	
1.0933	1.1366	
1.1367	1.1801	
1.1802	1.2236	
1.2237	1.2671	
1.2672	1.3106	
1.3107	1.3540	NO JUMPERS INSTALLED

JUMPER CONFIGURATION FOR AC CALIBRATION (RMS CONVERTER U32, CALIBRATION NETWORK, U33).

Table 4-13. Troubleshooting Guide

TEST AND SYMPTOM	POSSIBLE CAUSE
INITIAL TURN ON	
Display Blank	Power supply (Q6), power switch, interconnect, microcomputer U17
Display "stuck" with a constant reading	Touch and Hold on, Q11, Q12
Reads overload for several minutes after turn on	Q17, Power On Reset (U17 pin 8)
DISPLAY TEST	
All segments on	No drive (50 Hz squarewave, TP12) U10, interconnect, U17
All or no decimal points	U16, U17, interconnect
Decimal point in wrong location	U16, range switch input to U17
1 or more digits missing 1 or more annunciator missing	U10-16, interconnect, U17
LINEAR VOLTAGE TEST	
Display reading is out of tolerance	Out of calibration
Constant overrange in DC V	A/D, Check TP6, 7, and 8 for proper waveforms, U18, U19, U20
Does not respond to input voltages	R2 open, A/D input
Does not range properly in AC V	U17, U31, U22, Q7, Q8
dB VOLTAGE TEST	
Does not go into dB	Function switch input to U17
Does not autorange	U17, U31, U22, Q7, Q8
Display reading is out of tolerance	AC V is out of calibration
CURRENT TEST	
Does not respond to input currents	Fuse F1, F2
Display reading is out of tolerance on 1 or more ranges	R16, R17, R18, U6, U28, CR1
RESISTANCE/CONDUCTANCE TEST	
Reading is out of tolerance on 200Ω and 2 kΩ range	R3
Reading is out of tolerance on other ranges	U1, check 190V dc calibration
Readings are out of tolerance on high ohms	RV1, RV2, RV3 overheated from severe overload
Readings are noisy on all ranges	RT1, C39
Residual reading with test leads open	PCB is contaminated, see cleaning procedure in Section 4